Case Study ID

00-0031

ENERGY OFFICE

Case Study Series

American Center Building

Southfield, Michigan

Description

The American Center Building is a 24-story building and has 660,000 square feet of floor space. It was built in the mid-1970's for American Motors Corporation and was acquired by Chrysler Corporation when AMC was bought out. The primary use of the building is for office space, but has some retail space on the ground floor. The office space consists of both cubicles and individual offices. The basement has a parking garage along with space used for the building mechanical systems. All updates for this project were suggested and provided for by The Trane Company. Achieving an ENERGY STAR label for the building was a big selling point and the label will be awarded in July or August of this year. There was no known energy efficiency upgrades performed previous to the update by Trane. The project is helping the building to a 38% energy savings each month, and a guaranteed energy savings of $500,000 annually. The upgrades also led to a $120,000 annual reduction in operation costs. The energy savings were so high, "The local utility sent a representative to check the accuracy of our property's electric meters. They found the meters working properly. The large electrical savings were a result of Trane's PACT program," states Jim Jones, executive vice-president of REDICO Management, the company managing and operating the American Center building.

Energy Efficient Features

- Retrofit T12 fluorescent tubes and magnetic ballasts with T8 tubes and electronic ballasts
- Replace incandescent bulbs with compact fluorescent lamps (CFLs)
- Upgrade chiller plant
- Replace electric boilers with gas-fired modular boilers.
- Replace electric baseboard heating to hot water radiation heating
- Install variable frequency drives (VFDs) and Multiplexer system to domestic water pumping
- Install VFDs on air handlers.
- Install damper actuators and controls to air distribution and outdoor air management systems
- Integrate all HVAC controls and monitoring through the Trane Summit Building Control System, a central DDC building automation system.

Heating

The perimeter of the building uses hot water baseboard heat. The interior of the building has heat supplied by air handler heating coils to the ductwork going to each floor. The heating for the perimeter and exterior was originally done with two electric boilers each having 25 electric elements. The boilers demanded 1250 kW a piece to heat the building. There was also electric baseboard heat in the main lobby of the building.

It was found that heating with electric was very expensive especially with older boilers that were not very efficient by today's standards. The electric boilers also took a long time to heat the water and could not always keep up with the desired heating demand.

To reduce the heating costs six high efficiency gas-fired modular boilers replaced the two electric boilers. These new boilers have several benefits. First is that a BTU derived from natural gas is much cheaper than a BTU of electricity.

Second, using natural gas will allow more outside air to be brought in and heated. This will improve indoor air quality (IAQ) by reducing CO in the building. Third, a modular boiler system allows some boilers to run steady at peak efficiency while the rest of the boilers cycle on and off as needed. This reduces inefficient on/off cycling by most of the boilers. The boilers provide enough hot water so that the electric baseboard heat, where it existed, could be replaced with hot water radiation

Cooling

Cooling for the building is provided with a chilled water system. The system had two centrifugal chillers that were upgraded with new Trane high efficiency 650-ton water-cooled centrifugal chillers. The old chillers ran at about 0.9 kW per ton, the new chillers are at 0.52 kW per ton efficiency. The existing main air-handler motors had VFDs added to them. The existing air supply boxes had actuator motors and controls added to their dampers. The VFDs and controllable dampers allow airflow modulation for the air distribution system. The cooling system improvements also included adding VFDs to the cooling tower fans.

Improvements to the air ventilation system were also made which affect the amount of energy used for cooling. The building was converted from a constant air volume system to a variable air volume (VAV) system.

Modified outdoor air dampers with actuator motors and controls now allow airside economizer function. This allows for an appropriate amount of outside air to be used for "free cooling" when the outside air temperature is cool enough. This allows the chiller to stay off longer saving energy and giving the chiller a longer life. The added control over outdoor air also allows the building to bring in outdoor air to improve IAQ as needed. The building is also now receiving the correct amount of make-up air.

Domestic Water

VFDs and a Multiplexer System were added to the domestic water booster pumping system. The "multiplexer" controls the frequency and the switch over operation of the three pumps. Having variable frequency drives on the pumps allows each pump to use only the energy needed in response to the demand for water in the building at that time. Being able to switch between pumps allows for one or two pumps to be shut down when they aren't needed. This also extends the life of the system because pumps can be alternated.

Lighting

Previously the building was lighted mainly with T12 fluorescent tubes running on magnetic ballasts. Each old fixture held four of the T12 bulbs. Fluorescent lighting is now done with T8 tubes and electronic ballasts. Several setups of bulbs and ballast were tested with the tenants to see which setup made them happiest. The chosen retrofit uses two T8 tubes in a fixture with a reflector. The tenants found that the T8 tubes provided a brighter, whiter looking light than the T12 tubes had.

Some areas of the building were previously lighted with incandescent lamps. These lights have all been switched over to compact fluorescent lamps (CFLs). CFLs use about ¼ of the energy for a given amount of light output. CFLs also have a lifespan as much as 10 times longer than the equivalent incandescent lamp.

For more information regarding this Energy Project:

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